Degenerative Disc Disease, Active Component, U.S. Armed Forces, 2001-2011

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Degeneration of intervertebral discs is a common disorder that often leads to pain syndromes and mechanical dysfunction of the spine. Between 2001 and 2010, 131,986 active component service members received diagnoses of degenerative disc disease (DDD) during a hospitalization or at least two ambulatory visits (overall crude incidence rate: 951.4 per 100,000 person-years [p-yrs]). Annual crude incidence rates more than doubled during the surveillance period (2001: 614.9 per 100,000 p-yrs; 2010: 1,347.8 per 100,000 p-yrs). An estimated 68,247 days of lost duty time were attributed to DDD-specific diagnoses. Among service members diagnosed with DDD who subsequently deployed in support of overseas combat operations, more than two-thirds experienced exacerbations of their condition while deployed, although only 1.7 percent were medically evacuated. Deployed service members with DDD were more likely than a deployed comparison group to be medically evacuated for any cause.

Degenerative disc disease (DDD) is a common disorder that is characterized by a progressive degeneration of the intervertebral discs rendering them deformed and mechanically dysfunctional. Resultant loss of structural and functional integrity of the spine can lead to lumbar and/or cervical pain syndromes; consequently, DDD has been reported as a leading cause of low back pain.

DDD results in significant disability, work absenteeism, and healthcare costs.[1] Prevalence estimates of lumbar disc degeneration in the general population range from 3 to 56 percent.[2] This wide range in prevalence estimates likely reflects the absence of a standard definition of DDD and difficulty in diagnosing the disease accurately and reliably.[2] The epidemiology of DDD in military populations has not been extensively examined. Recently, Schoenfeld and colleagues reported an overall crude incidence rate of lumbar DDD (ICD-9-CM code: 722.52) in the U.S. military of 4.18 per 1,000 person-years (p-yrs); female service members and military members older than 40 years had the greatest risk of an incident diagnosis.[3]

Military training and operations are inherently physically demanding. Heavy load bearing, repeated strenuous activities and traumatic injuries may place military service members at increased risk of developing DDD; service members deploying with already diagnosed DDD are likely at increased risk of DDD exacerbations while deployed. Between October 2001 and September 2010, 16.3 percent of medical evacuations of service members from the U.S. Central Command's (CENTCOM) areas of operation were due to musculoskeletal disorders.[4] Intervertebral disc disorders and other (unspecified) disorders of the back accounted for 6.3 percent (n=3,401) of all evacuations of deployed male service members.[4] Another study found that 87 percent of all those evacuated for musculoskeletal disease/injury – and 86 percent of those evacuated for "spinal pain" – did not return to their deployed units.[5] In addition, 11.1 percent of all Medical Evaluation Boards of U.S. Army soldiers completed between January 2006 and January 2010 listed DDD as a primary reason for medical discharge from service.[6] Taken together, these data indicate that DDD is a substantial threat to service member health and military operational effectiveness.

This analysis examines the incidence, trends, and occupational and demographic characteristics of service members with DDD. It quantifies the health care burden and lost duty time associated with DDD as well as exacerbations in theater among individuals who deploy after being diagnosed with DDD. The analysis also assesses the risk of medical evacuation of deployed service members with a history of the condition.

METHODS

The surveillance period was from January 2001 to June 2011. The surveillance population included all individuals who served in an active component of the U.S. Army, Navy, Air Force, or Marine Corps at any time during the surveillance period.

Events of interest for this analysis were ambulatory encounters and hospitalizations with diagnoses suggestive of DDD. These events were derived from two sources: the Defense Medical Surveillance System (DMSS) documents medical encounters in fixed military and civilian (if reimbursed through the Military Health System) treatment facilities, and the Theater Medical Data Store (TMDS) contains records of medical care provided in the CENTCOM theater of operations. Additionally, the records of medical evacuations from the CENTCOM area of responsibility to medical treatment facilities outside CENTCOM were analyzed using data from the Transportation Command Regulating and Command & Control Evacuation System (TRAC2ES).

For surveillance purposes, an incident case of DDD was defined by any hospitalization with a DDD-specific diagnosis code in any diagnostic position; or by two or more ambulatory visits occurring within 183 days of each other with a DDD-specific diagnostic code in any position **(Table 1)**. Two measures were calculated to estimate the burden of DDD on the active component military population: total medical encounters and lost duty days. The total number of medical encounters is the sum

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14. ABSTRACT

Degeneration of intervertebral discs is a common disorder that oft en leads to pain syndromes and mechanical dysfunction of the spine. Between 2001 and 2010, 131,986 active component service members received diagnoses of degenerative disc disease (DDD) during a hospitalization or at least two ambulatory visits (overall crude incidence rate: 951.4 per 100,000 person-years [p-yrs]). Annual crude incidence rates more than doubled during the surveillance period (2001: 614.9 per 100,000 p-yrs; 2010: 1,347.8 per 100,000 p-yrs). An estimated 68,247 days of lost duty time were attributed to DDD-specifi c diagnoses. Among service members diagnosed with DDD who subsequently deployed in support of overseas combat operations, more than two-thirds experienced exacerbations of their condition while deployed, although only 1.7 percent were medically evacuated. Deployed service members with DDD were more likely than a deployed comparison group to be medically evacuated for any cause.

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TABLE 1. ICD-9-CM diagnostic codes for degenerative disc disorders

ICD-9-CM Code	Description
DDD-specific ICD-9-CM codes	
722.xx (excluding 722.8x, post laminectomy syndrome)	Intervertebral disc disorders
DDD-related ICD-9-CM codes	
723.0	Spinal stenosis, cervical
724.00, 724.01, 724.02, 724.09	Spinal stenosis,other
723.1	Cervicalgia
724.2	Lumbago
724.3	Sciatica
724.4	Thoracic or lumbosacral neuritis or radiculitis, unspecified
724.5	Backache, unspecified
738.4	Acquired spondylolisthesis

of all hospitalizations and ambulatory visits associated with an ICD-9 code of interest in the primary (first-listed) diagnostic position with a limit of one encounter per person per day. Lost duty days were calculated as the sum of hospital bed days plus one day for each ambulatory visit in which the discharge code indicated a disposition of sick at home or confined to quarters. Two estimates of each measure were calculated: one in which the primary diagnostic code was a DDD-specific code and one in which the primary diagnostic code was either a DDD-specific or a DDD-related code **(Table 1)**.

DDD exacerbations during deployment were assessed among service members diagnosed with DDD who subsequently deployed to CENTCOM in support of combat operations in Iraq or Afghanistan. A DDD exacerbation was defined as a DDD-specific or DDD-related diagnosis in any diagnostic position during any of the following events: a medical evacuation, a hospitalization, or an ambulatory encounter from five days prior to ten days after a medical evacuation; or two medical encounters in the deployed setting occurring within 183 days of each other.

Lastly, a control group for the deployed service members with DDD was randomly selected from all deployed service members without DDD; each deployer with DDD was matched to one control on gender, age, operation, and year of deployment **(Figure 1)**.

RESULTS

Incidence and characteristics of DDD cases

Between 2001 and 2010, 131,986 active component service members met the surveillance case definition of a DDD case. The overall crude incidence rate of DDD was 951.4 per 100,000 person-years (p-yrs) **(Table 2)**; annual crude incidence rates more than doubled during the surveillance period (2001: 614.9 per 100,000 p-yrs; 2010: 1347.8 per 100,000 p-yrs) and nearly tripled in the Army **(Figure 2)**. (Incidence rates and demographic characteristics are not presented for 2011 since data for the entire year were not available at the time of the analysis).

Crude overall rates of DDD were similar among males and females and increased sharply with age; service members 40 and older were 16 times more likely than those younger than 20 to be diagnosed with DDD **(Table 2)**. Among racial-ethnic subgroups, the highest overall crude incidence rate was among white, non-Hispanics (1,023.7 per 100,000 p-yrs). By service branch, the Army had the highest overall rate, followed by the Air Force. In regard to military occupation, the incidence rate was higher (1,190.0 per 100,000 p-yrs, IRR 1.30) among service members in healthcare than any other occupational group; of note, however, incidence rates increased during the surveillance period in all occupational groups **(data not shown)**.

Burden of non-deployed medical care

Between 2001 and 2010, the 131,986 individuals who were classified as incident DDD cases had 816,579 medical encounters for which DDD-specific diagnoses were recorded as primary (first-listed) diagnoses; an estimated 68,247 lost duty days were attributable to these encounters. The second, modified burden estimate, which included either DDD-specific or DDD-related codes in the primary diagnostic position yielded a total of 1,660,702

FIGURE 1. Algorithm for selecting prevalent DDD cases and controls for analyses of medical evacuation experiences during subsequent deployments

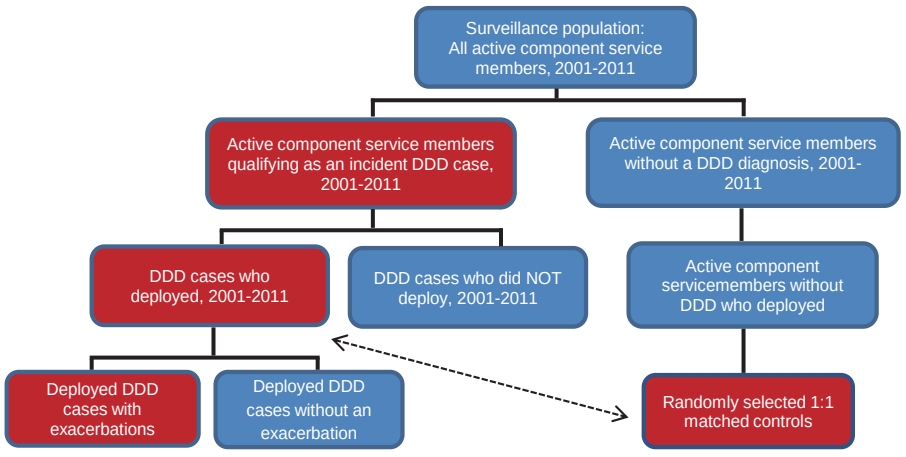


TABLE 2. Demographic and military characteristics of service members with degenerative disc disease, active component, U.S. Armed Forces, 2001-2011

	No.	Rate[a]	IRR[b]
Total	131,986	951.4	
Sex			
Male	111,988	945.3	Ref
Female	19,998	987.2	1.04
Age at diagnosis			
17-19	1,496	145.4	Ref
20-24	19,639	420.8	2.89
25-29	23,835	795.6	5.47
30-34	22,850	1,144.2	7.87
35-39	30,178	1,730.5	11.90
40+	33,988	2,360.2	16.23
Service			
Army	65,111	1,285.7	Ref
Navy	22,764	648.8	0.50
Air Force	33,281	960.7	0.75
Marine Corps	10,830	590.0	0.46
Race/ethnicity			
White, non-Hispanic	89,379	1,023.7	Ref
Black, non-Hispanic	21,720	881.3	0.86
Hispanic	11,100	790.9	0.77
American Indian/ Alaskan Native	4,258	656.0	0.64
Asian/Pacific Islander	1,821	790.5	0.77
Other	3,708	940.0	0.92
Grade			
E1-E4	32,577	534.8	Ref
E5-E9	74,356	1,343.4	2.51
O/W1-O/W3	11,126	814.3	1.52
O/W4+	13,927	1,582.0	2.96
Military occupation			
Repair/eng	17,320	981.7	Ref
Pilot/aircrew	5,505	986.8	1.01
Infantry/artillery/ combat eng	4,868	916.5	0.93
Armor/motor transport	37,221	906.6	0.92
Comm/intel	32,767	1,034.1	1.05
Healthcare	13,734	1,183.3	1.21
Other	20,571	795.8	0.81

[a]Incidence rate per 100,000 p-yrs of service
[b]Incidence Rate Ratio

medical encounters and 90,855 lost duty days attributable to DDD **(Figures 3a,b)**.

DDD exacerbations in the deployed setting

The proportions of deployed service members with DDD increased throughout the period from 1.5 per 1,000 in 2001 to 29.8 per 1,000 in 2011 **(data not shown)**. The increase in prevalence of DDD among deployers correlates with the increase in incident DDD diagnoses among service members overall during the period.

Prior to 2008, there were incomplete records (TMDS) of medical encounters in the deployed setting. As such, estimates of DDD exacerbations in the deployed setting were assessed only between January 2008 and June 2011. During this period, 68 percent of deployers with DDD experienced an exacerbation while deployed. DDD exacerbations in theater were relatively much more frequent among members of the Army than the other services; females were less likely than males to experience DDD exacerbations; and the youngest (17-19 years) and oldest (40+ years) affected deployers were more likely than others to experience exacerbations. Service members in the armor/motor transport occupational group had a higher proportion (approaching 1.0) of DDD exacerbations than those in other occupational groups **(data not shown)**.

Risk of medical evacuation

Of the 33,710 service members who deployed with prevalent DDD, 1,541 (4.6%) were medically evacuated from the CENTCOM theater during their deployments; in contrast, 754 (2.2%) service members with no prior diagnoses of DDD (control group) were evacuated for any cause. Less than 2 percent (n=574) of deployed service members with DDD were medically evacuated for back-related conditions (per primary [first-listed] diagnoses on relevant records); only 9 service members in the control group were evacuated with back-related primary diagnoses. Compared to their counterparts (control group), service members with DDD diagnosed prior to deployment had twice the odds (adjusted OR 1.98, 95% CI 1.78-2.20) of evacuation for any cause during deployment.

EDITORIAL COMMENT

This report documents that, over the past ten years, overall crude incidence rates of DDD diagnoses among active component service members have more than doubled; consequently, there has been a continuous and steep increase in lost duty time and medical care attributable to DDD and DDD-related medical care. Incidence rates of DDD diagnoses were slightly higher among females than males in all age groups, and incidence rates increased steadily with advancing age in both genders. In addition, more than two thirds of service members who were diagnosed with DDD prior to deployment experienced a DDD exacerbation that required medical care in theater.

Throughout the period of interest for this report, the percentage of deployers with DDD increased, mirroring the increase in incident diagnoses of DDD among U.S. military members overall. Although DDD exacerbations have been common in the deployed setting, most have been managed in theater and have not required medical evacuations. Despite this, deployed service members with DDD are almost twice as likely as matched controls to be medically evacuated for any reason; as expected, a greater percentage of those deployed with DDD are evacuated with diagnoses related to DDD although this affects a very small percentage (1.7%) of all those deployed with prevalent DDD. Therefore, while most deployed service members with clinical DDD exacerbations appear to be managed in theater successfully, additional study

FIGURE 2. Incidence rates of degenerative disc disease, by service, active component, U.S. Armed Forces, 2001-2010

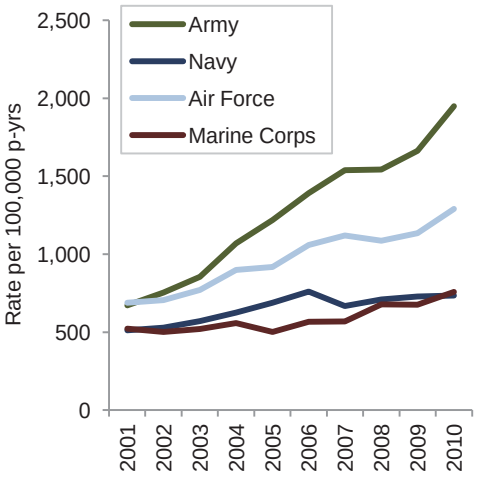
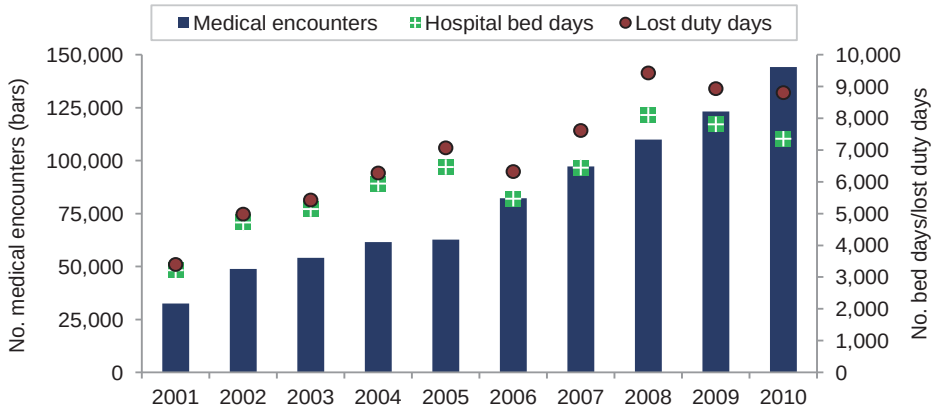
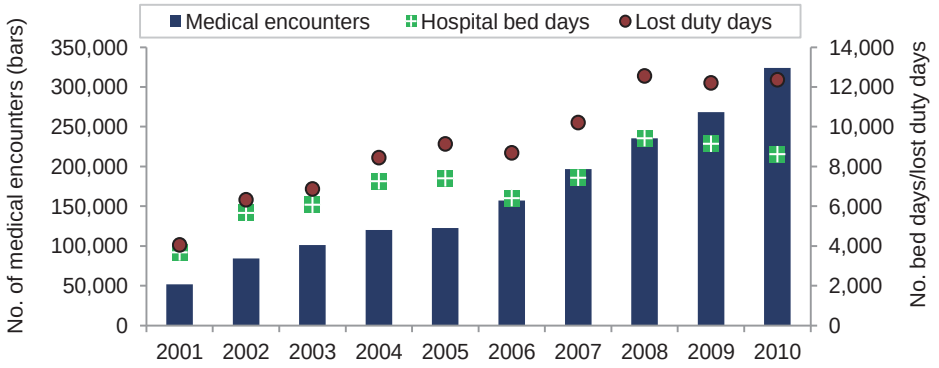


FIGURE 3. Medical encounters, hospital bed days and lost duty days attributable to DDD-specific and DDD-related conditions, active component, U.S. Armed Forces, 2001-2010

a. DDD-specific medical encounters only



b. DDD-specific and DDD-related medical encounters combined



is warranted to identify strategies in the management of DDD that could lessen its deployment-associated health care burden.

Several limitations should be considered when interpreting the results presented here. For example, several variables of potential interest, such as baseline health status, smoking status, and body mass index (BMI) were not addressed because of data limitations. Due to the inability to adjust for these potential confounders in the multivariate regression analysis, caution is necessary when interpreting the results. Future studies, given availability of the aforementioned data, may shed further light on the association between DDD status and the risk of medical evacuation during deployment. In addition, given that the active component of the US military is predominantly male, young, and relatively healthy compared to the general US population, the findings of this report have limited external validity and generalizabilty. Finally, the case definitions of DDD and DDD exacerbation used for these analyses were based exclusively on diagnostic codes (ICD-9-CM) that are recorded on electronic medical records. This method of case ascertainment increases the potential for misclassification; for example, some patients with DDD may not have had encounters documented with DDD-specific ICD-9-CM diagnostic codes. Also, because no ICD-9-CM code is specific for DDD exacerbation, the case definition of DDD exacerbation used here, which utilizes certain DDD-specific and DDD-related diagnoses and a particular temporal diagnostic relationship, is an imperfect surrogate for true clinical DDD exacerbations.

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